Research Finds Grass Buffers Degrade Herbicides, Trap Sediment

COLUMBIA, MO.

Forage grass buffers not only reduce herbicide runoff from croplands by trapping sediment, they also degrade the herbicides through increased microbial activity in the buffers' grass root zones.

"Forage grasses will trap sediment in runoff from cropland and decrease transport of sediment-bound herbicides. Forage grasses also increase the soil's water-holding capacity to increase infiltration and decrease the transport of herbicides dissolved in the runoff," said Robert Lerch, a University of Missouri soil scientist.

In addition, once herbicides enter the buffer, the grasses create conditions in their root zones that enhance microbial activity, leading to degradation of the herbicides, he said.

Researchers tested three types of buffer grasses for reduction of surface runoff of atrazine, metolachlor and glyphosate. Sloped test plots were tilled, had herbicides applied and were watered with a rain simulator.

Under what Lerch calls ideal conditions, eight meters of native warm-season grasses reduced herbicide transport by 80 percent. Less-controlled field conditions may vary from this figure, he said.

Across the board, native warm-season grass buffers outperformed buffers of tall fescue and switch grass in reducing herbicide transport.

Once deposited in the grass buffers, the grass species significantly increased atrazine degradation through enhanced microbial activity in the root zones. These microorganisms feed on the nitrogen and carbon in atrazine.

A second phase of the study measured microbial activity. Several forage grass species were grown to maturity in a growth chamber. The plants were then removed from the soil and atrazine was applied.

After 100 days of incubation, researchers measured the amount of three enzymes produced by soil-based microorganisms in the soil: glucosidase, dehydrogenase and fluorescein.

By measuring enzyme levels, the dissipation of atrazine and formation of atrazine breakdown products, researchers determined that all tested plant species enhanced atrazine degradation by creating conditions favorable to microbial activity.

Eastern gammagrass showed the greatest capability of promoting degradation of atrazine.

Microbial enzyme activities are promising indicators for evaluating the degradation potential of various vegetative buffers, said Chung Ho Lin, forestry research professor.

Herbicide concentrations and loads are especially high in claypan soils. Herbicide transport is seasonal with critical losses from April through June. Climate is the key factor in controlling herbicide annual variation in transport, he said. Δ